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Improvements to motor fuel taxation in Russia as impetus for sustainable development of cities

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Abstract. The article considers the role of the transportation system in the sustainable development of cities. The article pays special attention to the development dynamics of road transport in Russia and of the emissions of air pollutants by motor vehicles. The role and significance of fuel taxes in the system of government revenue are investigated. The author analyzes the existing system of fuel taxes in the Russian Federation and concludes that the mechanism of taxing motor fuel is based on consumption and does not take into account the adverse impact on the environment and the energy content of fuels. The author provides arguments for changing the mechanism of calculating the rate of the excise tax on motor fuel so that it factors in its energy efficiency and carbon dioxide emissions. A conclusion is drawn that the introduction of the proposed adjustments would produce a substantial fiscal impact on government revenues and would make it possible to eliminate the existing distortions for two competing sources of energy (petrol versus diesel fuel); would encourage the use and development of public transport and help reduce the emissions of air pollutants. The objective of the study is to work out proposals for improving fuel taxation that would also contribute to the sustainable development of cities.

Keywords: excise tax, petrol, diesel fuel, tax rates, road transport, CO₂ emissions, fuel efficiency.

1. Introduction

The sustainable development of cities has become a widely accepted strategy over the past decade as the larger part of the world's population. In Russia, for example, 74 % of people are city dwellers. Sustainable development is the sum total of multiple factors including

- economic well being that acts as the development driver for modern cities;
- urban environment and infrastructure (including the transport system) that form the living conditions and standards of the population;
- environmental conditions.

The role of the transport system in the harmonious development of cities cannot be overestimated. The transport system determines the look and viability of a modern city [1]. According to Vuchic [2], transport is the "the life force" of cities that connects all other subsystems and functions, including economic, social and other ones. Consequently, the efficiency of the urban transport system determines to a large extent the effective and reliable operation of other systems in a modern megalopolis.



Road transport plays the most important role in the transport systems of modern cities. From 2000 to 2016, the car fleet in Russia grew 110 %, primarily because of an increase in the number of passenger cars (Table 1). In 2016, the share of cars in the total vehicle stock was 87.5 %. As the passenger car fleet grows, the use of public transport declines considerably. From 2000 to 2016, the number of public transport passenger journeys declined by 59.6 %, while passenger journeys by tram and trolleybus – the most environmentally friendly modes of public transport – decreased 5.6-fold. As a result, privately owned passenger cars account for 90 % of road traffic today. The share of public transport and commercial vehicles is below 10 % [3].

Table 1. Motor vehicles and passenger journeys made by public transport in Russia

Indicator	2000	2005	2010	2015	2016	% of growth 2016 on 2000.
1. Motor vehicles, in thousand units. incl.:	24863	30497	39926	50605	51635	207.7
- passenger cars	20353	25570	34354	44200	45163	221.9
- trucks	4401	4848	5414	6230	6300	143.1
- buses	109	79	158	175	172	157.8
2. Passenger journeys made by all modes of public transport, in million. incl.:	43367	28724	21013	17953	17488	40.3
- by bus	23001	16374	13434	11523	11296	49.1
- tram, trolley bus	16180	8776	4285	3094	2880	17.8
- metro	4186	3574	3294	3336	3312	79.1

The growth in the number of privately owned cars brings about negative external effects that are most pronounced in big cities. The quality of atmospheric air has deteriorated considerably in some urbanized areas of the country, worsening public health problems and driving up mortality [4, 5]. Motor vehicles are one of the main sources of toxic pollutants and greenhouse gases (including CO₂) that harmful to health. Cities are more prone to higher concentrations of pollutants because of motor vehicles [6]. Carbon dioxide (CO₂) is the main constituent of the exhaust gases from internal combustion engines. Growing atmospheric concentrations of carbon dioxide causes climate change [7]. Pallavidino, Prandi et al [8] consider passenger cars to be a major source of CO₂ emissions.

Our analysis of the air pollutant emissions in Russia in 2000-16 shows that the volume of emitted pollutant did not increase, but the structure of emissions sources changed. Stationary sources have been able to decrease emissions, while motor vehicles accounted for 45.1 % of air pollutant emissions in the country in 2016, up from 41.8 % in 2000 (Table 2).

Table 2. Emissions of air pollutants in Russia

Indicator	2000	2005	2010	2015	2016	% of growth 2016 on 2000.
Emissions of pollutants into the atmosphere, million tons	32.3	35.8	32.7	31.3	31.6	97.8
Emissions of air pollutants from stationary sources, million tons	18.8	20.4	19.1	17.3	17.3	92.0
Emissions of air pollutants from motor vehicles, million tons	13.5	15.4	13.6	14.0	14.3	105.9
Share of vehicle emissions in the total emissions of pollutants into the atmosphere	41.8	43.0	41.6	44.7	45.1	107.9

Privately owned passenger cars are the biggest contributors to air pollutants emissions. Moreover, Hollantz and Tamms [9] showed that a high concentration of cars in a city not only leads to lower

efficiency of the entire transport system of the city, but generally decreases the quality of life and safety for the entire urban community.

Mayburov and Leontyeva [1] posit that all cities in Russia are in serious need of effective taxation and administration measures for regulating the development of various modes of city transport. The main goal of such regulation is to reduce the use of privately owned vehicles in urban areas and to drive up the use of public transport. Some economic studies [10, 11] have proved the effectiveness of indirect taxes as a regulatory tool for decreasing the emissions of CO₂ and other pollutants. Indirect taxes create pricing stimuli that force consumers to change their "polluting" behavior and act in a more eco-friendly and energy efficient way.

The excise tax on energy products (petrol, diesel fuel, motor oils) is included in the price of motor fuel and affect the cost of the journey. Today, the fuel tax rates in Russia do not factor in fuel efficiency and CO₂ emissions. Changing the mechanism of computing fuel tax rates by taking into account the above factors would increase the tax rates and the price of motor fuels and, consequently, provide an incentive for motorists to use public transport. As a result, one should expect a substantial increase in government revenues, lower air pollutants emissions, improvements in public health and better efficiency of the urban transport system. In other words, positive changes would occur in all key components of the sustainable development of cities.

2. Research methods

The author used various theoretical and empirical research methods. The theoretical methods employed included analysis, synthesis, generalization and classification. The analysis of the system of energy taxes in Russia showed that the mechanism of taxing motor fuel is based on the volume consumed but does not take into account negative environmental impacts and the energy content of the fuel.

The empirical methods that included observation and comparison were used for identifying main economic trends and substantiating and selecting a mechanism of computing the fuel tax rate in Russia that would factor in fuel efficiency and the level of CO₂ emissions.

Works by Russian and foreign scholars served as the methodological and theoretical foundation of the study. The list of data sources for the study included statutes and regulations, data of the Federal State Statistics Service (gks.ru) and the European Commission (ec.europa.eu), the press, online resources and the author's own research findings.

3. Results and Discussions

3.1. Fiscal importance of fuel taxes in the Russian Federation

Excise taxes on motor fuel fall into the category of indirect energy taxes. Table 3 indicates the role and importance of excise taxes on fuel in the system of government revenues in Russia.

Table 3. Environmental tax revenue by type of tax

Indicator	2012	2013	2014	2015	2016	% of growth 2016 on 2012.
Environmental taxes (excl. VAT and customs duties), % of GDP	4.9	5.1	4.7	4.8	4.5	-0.4
Excise taxes on fuel, % of GDP	0.6	0.6	0.5	0.4	0.6	–
Excise taxes on fuel, billion RUB. incl.:	358.8	412.9	395.3	314.5	485.6	135.3
- petrol	219.9	224.6	239.0	201.1	319.2	145.2
- diesel fuel	126.2	173.0	139.5	102.1	154.8	122.7

Over the assessed period, government revenues from environmental taxes (excluding VAT and customs duties) as a share of GDP varied from 4.5 % to 5.1 %. Over the five-year period, the figure

went down 0.4 %, but it still considerably higher than in the EU member states (2.3 % to 2.5 % of GDP). The mineral extraction tax contributes the biggest share to government revenues from environmental taxes, accounting for an average of 3.8 % of GDP. Indirect environmental taxes generate much smaller revenue. For example, fuel tax revenues as a share of GDP vary from 0.4 % to 0.6 %, which is much lower than in the EU (1.9 % of GDP on average across the European Union). It possible to conclude that the potential of environmental excise taxes is not fully utilised in the Russian Federation.

The primary taxable energy products that account for over 95 % of fuel tax revenues in Russia are petrol and diesel fuel. In 2016, revenues from the excise tax on petrol made up 65.7 %, or two thirds of total government revenues from fuel taxes. Meanwhile, the consumption of diesel fuel by all types of motor vehicles is four times higher than the consumption of petrol (18.5 m tonnes versus 4.6 m tonnes). This indicates a competitive distortion between the two main types of motor fuel.

Revenues from the excise tax on petrol grew the fastest between 2012 and 2016 (145.2 %). Revenues from an excise tax are usually an outcome of the consumption of the taxable product and changes in the tax rates. From 2012 to 2016, the actual volume of petrol consumption did not change considerably. In 2013, for example, petrol consumption increased 3.6 %, but then decreased annually by 0.2 to 0.8 %. The tax rate for petrol increased by 48.5 % to 80 % (Table 4) depending on the type of petrol. The slower growth in revenues from petrol tax, by contrast with the increase in the tax rate, is due to a transition to production of better-quality petrol that is taxed at a lower rate. Consequently, there has been an environmental effect of the tax because the consumption of greener petrol reduces the harmful impact on the environment.

In 2015, there was a drop in tax revenues from both petrol and diesel fuel for road use. That was due to a "tax maneuver" that is essentially a cut in export customs duties and excises imposed on oil and oil products along with a hike in mineral resources extraction tax and a decrease in the rates on petrol (by 15 to 35 % depending on its environmental class) and diesel fuel (by 45 %). The maneuver was aimed at preventing an increase in the prices of oil products in the domestic market. The cut in the tax and customs duty rates was executed in line with an agreement of the Eurasian Economic Union on the establishment of a common market for oil products and crude oil and unification of export duties.

3.2. Excise fuel taxes in Russia today

Petrol has been on the list of excisable products in Russia since 1996. Originally, the tax was levied as a percentage of the sales price. Starting from 1998, the tax is levied as a fixed rouble-per-tonne rate and varies based on octane levels. In 2001, diesel fuel was placed on the list of excisable products, and the tax rates grew considerably.

The most significant reform of fuel taxation took place in 2011 when a transition was made from tax rates pinned to octane ratings to tax rates varying by emissions standard type. Additionally, motor oils, straight-run gasoline, and other fuels were included in the list of excisable energy products in 2011. Between 2015 and 2018, there has not been any considerable changes to the list of excisable products (Table 4).

In Russia, like in European countries, fuel taxes are charged on a per unit volume of the consumed fuel that is used as the tax base. The tax base does not reflect the amount of pollutants that the fuel contains, yet the tax rates vary by fuel environmental class. The rates are lower for greener fuels (Euro 5 petrol) and higher for the types of petrol that are below the Euro 5 standard.

Since the existing tax rates are based on fuel consumption, but do not take into account the carbon footprint of the fuel and its energy content, the approach results in distortions for competing sources of energy, for example, petrol versus diesel fuel. Diesel fuel is far more efficient than petrol and causes a lot more damage to the environment. Some expert assessments find that petrol for road use generates negative environmental impacts of 5.9 euro cents per km, while diesel fuel generates 7.7 euro cents worth of environmental damage per km. However, both in Russia and the EU member states diesel fuel is taxed at a lower rate than petrol despite the former's higher energy efficiency and environmental

hazard. In Russia, however, the tax rate for petrol and that for diesel fuel vary at a wider margin. In 2018, the tax rate charged on petrol that is below the Euro 5 emissions standard was 70 % higher than the tax rate for diesel fuel, whereas in the EU the minimum tax rate for petrol is 27.6 % higher than that for diesel fuel. The actual tax rate difference in most EU countries is even narrower. In Russia, however, diesel fuel tax rates have been growing faster (up 120 % between 2015 and 2018) than those for petrol and much faster than the rate of inflation.

Table 4. Fuel tax rates in Russia, RUB per tonne

Excisable product	2015	2016	2017	2018	% of growth 2018 on 2015
Petrol:					
✓ below Euro 5 standard	7300	10500	13100	13100	179.5
✓ Euro 5	5530	7530	10130	11213	202.8
Diesel	3450	4150	6800	7665	222.2
Motor oils	6500	6000	5400	5400	83.1
Straight-run gasoline	11300	10500	13100	13100	115.9
Benzene, paraxylene, ortho-xylene, jet fuel	2300	3000	2800	2800	121.7
Middle distillates	x	4150	7800	8662	x

The disproportion is due to the fact that petrol is primarily consumed by individuals using cars, while diesel fuel is largely consumed by transportation businesses (most of freight vehicles and buses are powered by diesel fuel). A lower tax rate for diesel fuel and, consequently, a smaller share of the tax in the selling price work as an incentive for road freight transport and alleviates the tax burden for the cargo industry. Non-commercial consumption of diesel fuel has, however, been growing. Higher demand for diesel fuel has been pushing prices up in comparison with petrol prices.

The cost of producing diesel fuel is much lower than the cost of refining oil into petrol. The reason lies in the technology that apart from straight distillation incorporates such costly processes as isomerization, reforming, catalytic cracking with hydrotreatment, and alkylation. The diesel fuel production process only includes fractional distillation and hydrotreatment [7]. The selling prices of diesel fuel and petrol and the narrow gap between them do not match the relevant cost of production and are largely due to growing demand for diesel fuel in the market. At present, petrol stations sell petrol and diesel fuel at the same prices despite the fact that the cost of diesel fuel production and the excise tax on diesel fuel are much lower than that of petrol. Consequently, it is oil refineries, middlemen and petrol stations who get to keep the additional revenues generated by the higher demand for diesel fuel, whereas the government is losing on the insufficiently low tax rate.

The excise tax accounts for a fairly high share of the selling price of petrol and diesel fuel in European countries – from 30.5 % in Hungary to 46.4 % in the UK for diesel fuel, and 33.6 % in Hungary to 50 % in the Netherlands for petrol. In Russia, the excise tax accounts for an average of 24 % of the selling price of petrol and 16 % of the selling price of diesel fuel. Given the considerably lower tax rates on main fuels in Russia than in Europe, there is enough room for an increase.

In general, the motor fuel taxation mechanism does not appear to be optimal and needs improving.

3.3. Ways of improving excise taxes on motor fuel in Russia

The mechanism of charging environmental taxes in Russia and the EU countries is based on fuel consumption and does not take into account negative environmental impacts and the energy content of the products being consumed. In the Russian Federation, the environmental damage caused by the combustion of fuels is reflected in tax rates that vary by fuel eco-class and fuel use. Consequently, both in Russia and the EU, motor fuels and other energy products are taxed on the basis of their environmental impacts that are, however, not entirely computed in the taxes. As a result, there are distortions in the taxation of competing fuels (petrol versus diesel fuel) that show in unreasonably low

tax rates on diesel fuel compared with petrol and the non-receipt of substantial tax revenues by the government.

A design of fuel excise tax that factors in the environmental impacts of fuel consumption should help strike a match between the tax burden and the environmental pollution caused by the taxed product, and therefore make taxation fairer and equitable. The implementation of such an approach calls for a change to the mechanism of motor fuel taxation. It is necessary to eliminate distortions between competing fuels and create incentives for better energy efficiency and emissions reduction.

The author believes that taxes on motor fuels must take into account their energy content and environmental impacts. Some authors [4, 7] propose introducing a carbon tax. Today, a tax on CO₂ emissions is used in Denmark, Ireland, Finland and Sweden, but it is not harmonized at EU level. It is worth taking a look at the European Commission's proposal to revise the Energy Tax Directive and adopt energy taxes that would be split into two components:

- one component would be based on the emissions of CO₂ from the energy product and would be charged on a per-tonne basis;
- the other component would be based on the energy content of the product, rather than its use. The minimum rate was proposed to be set at a euro-per- GJ basis.

In practice, though, it might be difficult for the taxpayer to determine the tax base (to measure CO₂ emissions and the amount of generated energy) in compliance with the proposed mechanism.

That being said, the system of fuel taxation in the Russian Federation should be designed with the following considerations in mind:

1. The tax base remains the same: the volume of consumed fuel expressed in tonnes.
2. When computing the tax rate it is necessary to factor in CO₂ emissions and energy content.
3. CO₂ emissions from the combustion of fuel depends on its density. The density of petrol is around 0.75 kg/L; the density of diesel fuel is around 0.84 kg/L. Carbon dioxide emissions of petrol-powered cars amount to 3.134 tonnes-per-tonne, and 3.174 tonnes-per-tonne in diesel-powered cars. The calorific value of petrol is 30.8 MJ/L, or 41.06 GJ/t. The calorific value of diesel fuel is 36.3 MJ/L, or 43.22 GJ/t. The per-tonne charge for CO₂ emissions is set at 575.6 RUB; the per-GJ charge for emitted energy is set at 11,305 RUB.
4. The tax rate for petrol remains unchanged.
5. The tax rate for diesel fuel will be 13,730 RUB per tonne.

The fiscal impact of the revised tax will be significant provided that the production and consumption of diesel fuel in Russia remain unchanged and the tax rate is set at 13,730 RUB per tonne of diesel fuel (an equivalent of 221.5 dollars per tonne). In that case, annual revenue from the excise tax is projected to grow by 122.5 bln RUB (an equivalent of 1,975.5 m dollars).

If implemented, the proposal would encourage the consumption of energy from sources which produce less CO₂. The energy component of the tax rate would make it possible to eliminate the existing distortion of competition between petrol and diesel fuel. Taxation of fuel and energy products tied to energy content and CO₂ emissions would encourage a more effective use of energy resources and reduce carbon dioxide emissions because the proposed mechanism sends a clear price signal to the consumer about the real energy value of the product he consumes. It would also be unnecessary to introduce a separate tax on carbon dioxide emissions.

The downside of a higher excise tax on diesel fuel is that it would drive up selling prices and, consequently, the expenditures of individuals and transportation companies and transportation costs in other industries, including agriculture. The price growth would be less significant compared to the hike in the excise tax if oil refineries and petrol stations reduced their profit margin. Higher transportation costs incurred by agricultural producers could be smoothed out with subsidies for agriculture businesses in order to keep agricultural commodity prices down.

The higher cost of motor fuel will spur a transition to more efficient and environmentally friendly vehicles and alternative fuels (natural gas, propane, electricity). Motorists will be encouraged to use public transport. Haulage businesses will have to streamline logistics. All of this will reduce car

ownership rates and motor traffic in big cities, improve the environmental situation and public health and make the urban transport system more effective.

4. Conclusion

The analysis of the system of excise taxes on motor fuel for road use in Russia shows that the taxation mechanism is based on consumption and does not take into account negative environmental impacts and energy content. Moreover, there is distortion of competition between the two main types of motor fuel – petrol and diesel fuel – that shows in unreasonably low tax rates charged on diesel fuel compared with petrol and the non-receipt of substantial tax revenues by the government. The existing motor fuel tax system fulfills the fiscal and regulatory functions of taxation quite effectively, is not optimal and needs improvement.

Excise tax tied to the energy efficiency and carbon dioxide emissions of fuel could generate additional public revenue to an amount of 122.5 bln RUB (an equivalent of 1,975.5 m dollars) annually provided that the production and consumption of diesel fuel in Russia remain unchanged. Taxes are a powerful instrument for influencing taxpayers' behavior with economic means and encouraging them to use "green" fuel and environmentally friendly vehicles. The implementation of the proposed novelties will drive up tax rates and the selling prices of diesel fuel, thus reducing its consumption and spurring a transition to more efficient and environmentally friendly vehicles and alternative fuels. One should, therefore, expect an increase in public revenue, a decrease in pollutant emissions, a reduction in car traffic, improvements in the environmental situation and public health in cities and better efficiency of urban transport systems, which will eventually contribute to the sustainable development of cities.

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